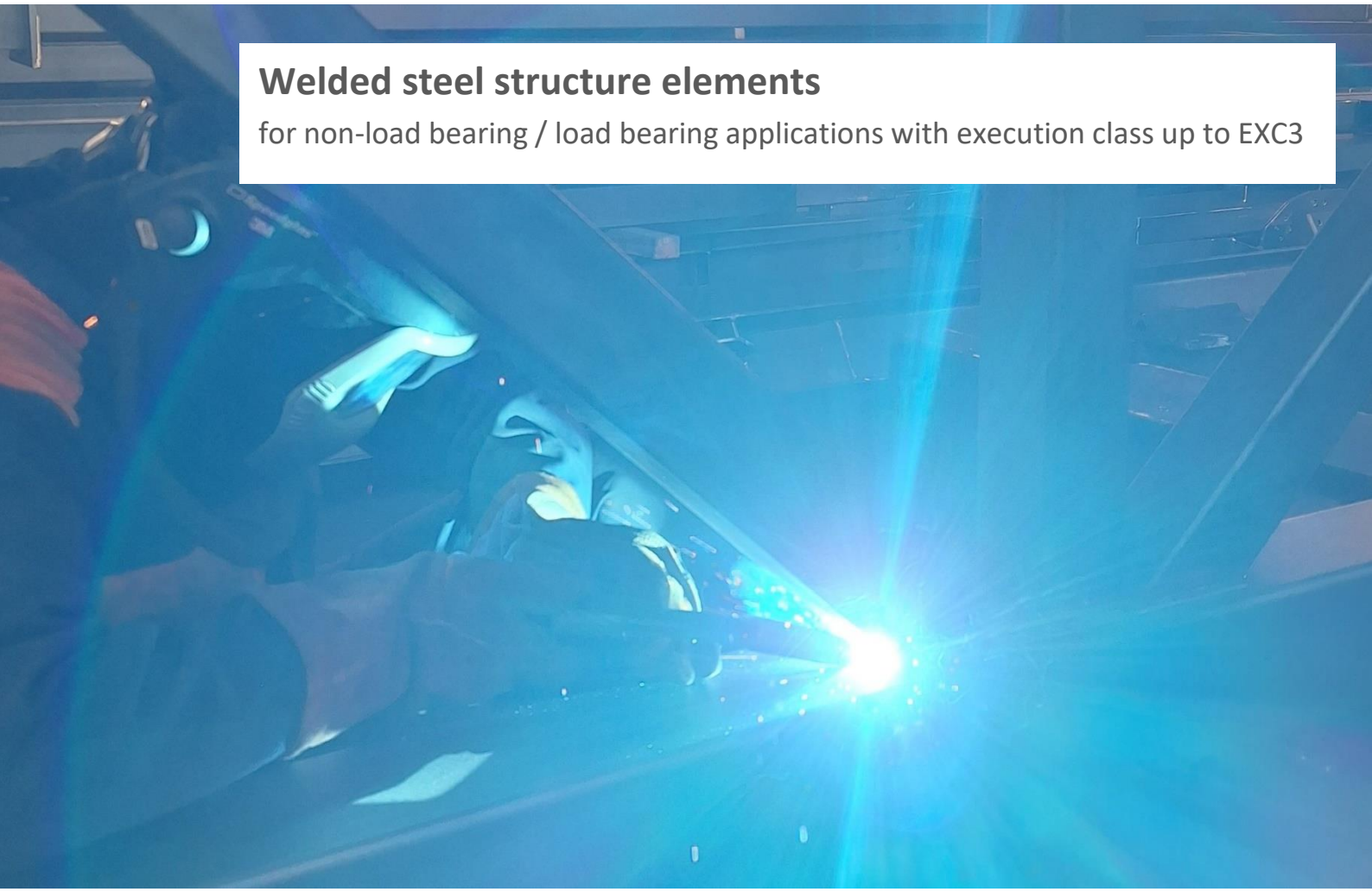
Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	SIA Ventspils metināšanas rūpnīca
Publisher:	Kiwa-Ecobility Experts
Program operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000400-EN
Issue date:	04.04.2024
Valid to:	04.04-2029



Welded steel structure elements

for non-load bearing / load bearing applications with execution class up to EXC3

1. General information

SIA Ventspils metināšanas rūpnīca

Programme operator:
Kiwa-Ecobility Experts
Kiwa GmbH, Ecobility Experts
Wattstraße 11-13
13355 Berlin
Germany

Declaration number:
EPD-Kiwa-EE-000400-EN

This declaration is based on the Product Category Rules:
PCR A – General Program Category Rules for Construction Products; version 2.1

PCR B – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; version 2020-03-13 (draft)

Issue date
04.04.2024

Valid to:
04.04.2029

Raoul Mancke
(Head of programme operations, Kiwa-Ecobility Experts)

Martin Koehrer
(Verification body, Kiwa-Ecobility Experts)

Welded steel structure elements

Owner of the declaration:
SIA Ventspils metināšanas rūpnīca
Rūpniecības iela 39,
Ventspils, LV-3601
Latvia

Declared product / declared unit:
1 metric ton of steel structure elements

Scope:
The EPD (type: Cradle to gate with options, modules C1-C4 and module D (A1-A4, C, D)) is based on LCA of the custom made welded and painted steel structures, manufactured in Ventspils, Latvia. The calculation is based on 1 metric ton of welded and surface treated steel structure elements with a share of 99% steel materials.

Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA data and evidence.

Verification:
The European standard EN 15804+A2:2019 serves as the core PCR.

Independent verification of the declaration and data, according to EN ISO 14025:2010.

☐internal ☒external

Elisabet Amat Guasch
(Third party verifier)

2. Product

2.1 Product description

Welded steel structure elements are fabricated as individual elements from which the frames of buildings and structures or other load bearing frames are assembled on construction sites. These structures can be used in every type of building, including, industrial buildings, agricultural buildings, commercial buildings. The steel structures (load bearing structures) are manufactured according to EN 1090-2, up to EXC 3, and are CE marked.

UN CPC code: 421 Structural metal products and parts thereof.

2.2 Application

The products are prefabricated elements and are intended to be used as part of building (e.g. columns, beams, trusses, connections) or various auxiliary instalments like bridge, pylon, structures, indoor and outdoor stairs and other construction elements.

2.3 Reference Service Life (RSL)

The reference service life for the steel structures is set at 50 years. It should be noted that the Use stage with modules B1-B5 is not declared.

2.4 Technical Data

Technical Parameters – Welded steel structure elements

Characteristic	Unit	Value
Steel material	-	S355 (according to EN 10025)
Dimensions	-	Vary based on specific project requirements
Execution Class (EN 1090)	-	Up to EXC3
Paint system (thickness of coating)	µm	60 – 300 (as per EN ISO 12944-5)

2.5 Placing on the market / Application rules

Welded steel structure elements are manufactured in accordance with the requirements of the harmonized standard for steel structures EN 1090-1 (certification under system 2+). Welding processes are certified according to EN ISO 3834-2 standard. According to the Regulation (EU) No. 305/2011 Construction Products Regulation or CPR, the essential properties of products are declared in the CE marking and Declaration of Performance, which are delivered with the products (for load bearing products).

Market: Europe. The Swedish and Finnish markets are used for modelling A4.

2.6 Base materials

Raw material	Unit	Value
Steel materials *	%	98,3
Welding consumables	%	0,7
Coating/ finishing (primers, paints, hardeners)	%	1,0
Total sum	%	100

*Note: * Type of steel materials: steel plates (41,9%), flat bars (0,1%), steel profiles (HEA, HEB, IPN, UPN, UPE) and angle bars (32,6%) and steel profiles (CFSHS, CFRHS, SFCHS) (25,4%). Steel material thickness 2-70 mm. The steel is mainly hot rolled material, with secondary content of 49% (corresponds to the average weighted secondary content based on information from suppliers of SIA Ventspils metināšanas rūpnīca (e.g. type of production route EAF/BF, information from EPDs and delivery documents etc.)).*

No dangerous substances from the candidate list of SVHC for Authorisation are used in the product.

2.7 Manufacturing

The steel structures of industrial and civil objects from SIA Ventspils metināšanas rūpnīca are made according to drawings. The manufacturing route contains the following processes:

- Extraction and delivery of raw materials;
- Shotblasting;
- Plasma cutting / sawing/ bending / drilling etc.;
- Assembling;
- Welding;
- Preparation of steel surfaces;
- Coating (paint system);
- Packing and storage;
- Transportation (delivery of finished products - provided by the customers).

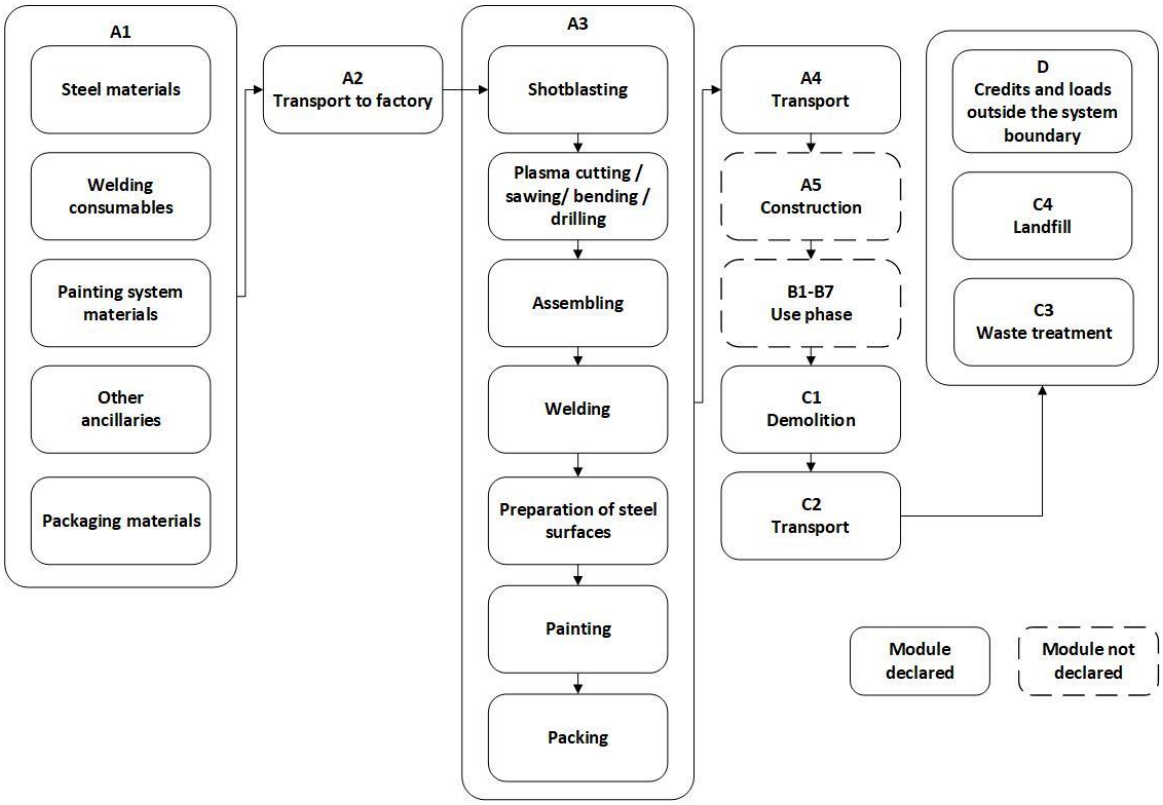


Figure 1: Overview of the production route of welded steel structure elements (A1-A4, C1-C4, D)

2.8 Packaging

The packaging is based on metallic tension tape, re-usable timber spacers/ beams and PE foil. Transportation does not cause any losses, since the products are securely fastened. After use, packaging materials can be re-used or recycled.

2.9 Production waste

The data on generated production waste is recorded as accurately as possible. Thus, the generated production waste is allocated per declared unit.

2.10 Further Information

Further information on the product can be found on the manufacturer's website:
https://www.vmr.lv/en/

3. LCA: Calculation rules

3.1 Declared unit

This declaration, including data collection and modeled foreground system including results, represents the production of steel structures in a manufacturing plant located in Ventspils, Latvia. Product-specific data is based on averages collected from January 2022 to December 2022. In accordance with PCR B (Product Category Rules for steel construction products from the EPD programme of Kiwa Ecobility Experts), one metric ton was chosen as the declared unit for all types of steel structures.

3.2 Conversion factors

Description	Unit	Value
Declared unit	metric ton	1
Density	kg/m3	7850
Steel material	-	S355 (according to EN 10025)
Conversion factor to 1 kg	-	0,001

3.3 Scope of declaration and system boundaries

This EPD was created in accordance with the requirements of EN 15804 and includes the Production stage (A1-A3), Transportation to the site (A4), the End-of-life stage (C1-C4) and the Benefits and Loads beyond the system boundary (D). According to EN 15804 this corresponds to product phases A1-A4, C1-C4 and D (EPD type "Cradle to gate with options, modules C1-C4 and module D" (A1-A3, C, D and additional module A4)).

System boundary description

Description of the system boundary																
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manu-facturer to place of use	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography																
EU	EU	LV	SE, FI	-	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
X=Module declared | MND=Module not declared																

All major materials, production energy use and waste are included for phases A1, A2, A3, A4, C1, C2, C3 and C4. The Use stage (B1-B7) is not relevant for this type of product and is not declared.

3.4 Geographical reference area

The reference year for collecting data is 2022 (01.2022 – 12.2022). The geographical reference area is Europe or Global and can be seen in the table System boundary.

3.5 Cut-off criteria

The study does not exclude any modules or processes which are stated mandatory in the EN 15804 and applicable PCR. The study does not exclude any hazardous materials or substances included in the Candidate List of Substances of Very High Concern (SVHCs) for authorization with concentrations higher than 0.1% weight by weight. All material flows that contribute to more than 1% of the total mass, energy or environmental impact of the system have been considered in the LCA. It can be assumed that the neglected processes in total contributed less than 5% to the considered impact categories.

The product stage includes materials, energy and waste flows only related to production processes (e.g. energy and water use related to company management and sales activities are excluded where technically possible; production, manufacture, and construction of manufacturing capital goods and infrastructure, other processes which are not directly related to the production of steel structures).

3.6 Allocation

There are no co-products in the raw material supply phase, so no allocation methods were used at this stage. There are no allocations during the manufacturing phase at the plant. Appropriation or attribution of inputs and outputs, e.g. auxiliary materials, energy (utilities), waste has been done on the basis of production volumes in 2022 (reference year).

The background data is taken from Ecoinvent version 3.6 (2019) Allocation, cut-off library. Almost all consistent datasets contained in the Ecoinvent database is documented and can be viewed in the online Ecoinvent documentation. Allocation principles in the background are in compliance with the foreground. Specific information on allocations within the background data can be found in the Ecoinvent database version 3.6 (2019) document.

3.7 Data collection and reference time period

In the operating data survey, all relevant process-specific data has been collected. The data relating to the production phase of the steel structures were determined by SIA Ventspils metināšanas rūpnīca. All process-specific data was collected for the production year 2022. The quantities of raw and ancillary materials as well as energy consumption, have been recorded and averaged over the entire operating year.

Secondary data was taken from the Ecoinvent 3.6 (2019) database. The database is regularly checked and thus complies with the requirements of ISO 14040/44 (background data is not older than 10 years). The background data meets the requirements of EN 15804.

The Life Cycle Assessment was modelled with the R<THiNK software from NIBE. The background data is taken from Ecoinvent version 3.6 (2019) “Allocation, cut-off” database. Geographical reference space of the background data is Europe or Global. Almost all consistent datasets contained in the Ecoinvent database are documented and can be viewed in the online Ecoinvent documentation. The reference year to collect all input data is 2022. The geographical reference area can be seen in the System description boundary table.

The general rule has been followed that specific data from specific production processes or average data derived from specific processes must be given priority when calculating an EPD or Life Cycle Assessment. Data for processes that the manufacturer can not influence or choose, were backed up with generic data.

3.8 Estimates and assumptions

In a typical steel structure manufacturing process, the individual components such as steel materials (hot-rolled steel plates, profiles, bars, sections etc.), welding consumables, coating materials (primers, paints) and other ancillary materials are delivered to the production facility. All the raw materials are mainly delivered by inland transport, truck or rail. Until the materials are actually used in production, they are stored in the warehouse. The steel structures of industrial and civil objects are made according to the developed drawings. The following processes are carried out in production: shotblasting , cutting of profiles and sheets, assembly, welding, priming/ painting of structures (the paint layer depends on customer requirements) and packing for delivery.

All inputs, including raw materials, primary products, energy, and auxiliary materials as well as the accumulated waste are considered in the assessment. The use of the final product is not within the manufacturer's sphere of influence. Therefore, modules B1-7 have not been considered.

Production stage

A1: This stage considers the extraction and processing of raw materials as well as energy consumption. All installed raw materials of the products were analysed, and the masses were determined. Steel material is given as a sum of different hot-rolled or cold-rolled steel raw materials.

A2: The raw materials are transported to the manufacturing plant. In this case, the model includes relevant transportation of each raw material. Supplier information regarding the transport distances and vehicle type were provided by SIA Ventspils metināšanas rūpnīca or chosen from relevant market profiles or background datasets. Where no precise information on secondary materials, secondary fuels and waste was not available, secondary content was indicated based on the documentation of the background processes.

A3: This stage includes manufacturing of the products and packing. It also considers the energy consumption and waste generated at the manufacturing site. The national electricity mix of Latvia was taken into account.

Assembly stage

A4: This stage includes transport from the production stockyard to the construction site where the prefabricated product shall be installed. Two scenarios for transportation from SIA Ventspils metināšanas rūpnīca production site to customers in Sweden (Stockholm) and Finland (Helsinki) were developed. The transportation does not cause any losses as products are secured properly.

Vehicle capacity utilization volume may vary, but since transportation emission in total results is small, the variation in load is assumed to be negligible and calculated as an average load factor. SIA Ventspils metināšanas rūpnīca declares the vehicle type not less than EURO 6.

A5: Installation process is not declared. The packaging is not modelled in C-D modules as it is discarded in module A5 which is not declared.

End of life

C1: This module concerns the removal of a steel structure. The demolition process (C1) consumes energy in the form of diesel fuel used by building machines (e.g. lifting cranes, mobile rough terrain crane, forklift).

At the end-of-life, in the demolition phase 100% of the waste is assumed to be collected as separate construction waste.

C2: Transport module concerns transportation to waste processing. All of end-of-life product is assumed to be sent to the closest facilities (C2).

C3 and C4: Waste processing and final disposal are as following: 94% of the end-of-life product is sent to recycling (C3), 5% is re-used and 1 % is landfilled (C4).

D: Due to the recycling potential of the metal, the end-of-life product is mainly converted into recycled raw materials (D). Loads and benefits of recycling, re-use and exported energy are part of module D. The benefits are calculated based on the primary content and the primary equivalent.

All inputs including raw materials, primary products, energy and ancillary materials as well as the accumulated waste are considered in the assessment. The default End-of-life scenarios of the Annex to the NMD Determination method ver. 1.1 (March, 2022) have been used for the product and various materials of ancillaries.

The transportation to the construction site is overviewed based on the data provided by SIA Ventspils metināšanas rūpnīca. The use of the final product is not within the manufacturer's sphere of influence. Therefore, modules B1-B7 have not been considered.

3.9 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used , functional or declared unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

4. LCA: Scenarios and additional technical information

All installed raw materials of the product were analysed, and the masses were determined following the allocation and cut-off requirements. Production-specific energy consumption was measured and provided by SIA Ventspils metināšanas rūpnīca.

Since the production process is quite similar for all of steel products produced at the manufacturing site, the energy consumption, ancillary materials, and production waste were appropriated according to the annual use of steel materials and then declared per 1 metric ton of the products. The total annual production data is recorded to a high standard of accuracy and precision.

The production waste is collected separately. As the product is marketed internationally, no country-specific waste scenario can be considered. Therefore, the waste scenarios of NMD (2022) were adopted.

Module A4: This stage includes transport from the production stockyard to the construction site where the prefabricated product shall be installed. Transportation is calculated based on data from the manufacturer and scenarios with parameters described in the following tables.

Transport from the production site to the construction site (A4) – Sweden scenario

Parameter	Vehicle type	Distance
Truck	Lorry (Truck) 16-32t, EURO6 | market for (EU)*	64 km**
Maritime	Ship/ Transoceanic freight ship, containers*	283 km***

Notes:

** Data for transport is calculated for an average load factor, including empty return trips*

*** Total distance by truck: from the manufacturing site (Ventspils, Latvia) to the terminal located in Ventspils, Latvia (4 km) and from the port in Nynashamn, Sweden, to the construction site in Stockholm, Sweden (60 km).*

**** Total distance by ship: Ventspils – Nynashamn.*

Transport from the production site to the construction site (A4) – Finland scenario

Parameter	Vehicle type	Distance
Truck	Lorry (Truck) 16-32t, EURO6 | market for (EU)*	530 km**
Maritime	Ship/ Transoceanic freight ship, containers*	82 km***

Notes:

** Data for transport is calculated for an average load factor, including empty return trips*

*** Total distance by truck: from the manufacturing site (Ventspils, Latvia) to the terminal located in Tallinn, Estonia (520 km) and from the port in Helsinki, Finland, to the construction site in centrer of Helsinki, Finland (10 km).*

**** Total distance by ship: Tallinn – Helsinki.*

Module A5: not declared.

Modules B1 to B7: not declared. In normal use scenario, it is assumed that no maintenance (B2), repair (B3), replacement (B4) and refurbishment (B5) are needed.

C1: This module concerns the removal of a steel structure. The demolition process (C1) consumes energy in the form of diesel fuel used by building machines (e.g. lifting cranes, mobile rough terrain crane, forklift). According to Erlandsson, M. and Pettersson D. (2015) energy consumption of a demolition process is on average 12 kWh/t.

At the End-of-life, C2 - C4 and D, it is assumed that steel material is separated after deconstruction. A waste scenario according to the Dutch National Environmental Database (NMD) is applied: Steel, construction profiles, where 94% of steel material is recycled, 5% is reused and 1% landfilled.

All end-of-life products are assumed to be sent to the closest facilities (C2).

Transport to waste processing (C2)

Parameter	Vehicle type	Distance
Truck*	Transport, freight, lorry, unspecified	Landfill:100 km; Incineration: 150 km; Recycling: 50 km; Re-Use: 0 km

*Note: * For all transports, the environmental profile of a non-specific truck transport was used (conservative assumption): The vehicle operates with diesel, and it provides a fleet average that includes different lorry classes as well as EURO classes. This transport used an average load factor, including empty return trips.*

End of life (C1, C3, C4)

Name	Unit	Value
Collected separately waste type	kg	1000,00
Collected as mixed construction waste	kg	0,00
Re-use	kg	50,00
Recycle	kg	940,00
Energy recovery	kg	0,00
Landfilling	kg	10,00

The scenarios included are currently in use and are the most representative scenarios. End of life treatment is based on current practices taking place in Europe.

Benefits and loads beyond the system boundary (D)

Name	Unit	Value
Substitution of electricity	MJ	0,00
Substitution of thermal energy	MJ	0,00
Substitution of raw materials	kg	512,01

The benefits of avoided materials are calculated based on the primary content and the primary equivalent.

5. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

LCA results – Indicators describing environmental impacts based on the impact assessment (LCIA): one metric ton of welded steel structure elements (EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4 SWE**	**A4 FIN**	**C1**	**C2**	**C3**	**C4**	**D**
Core environmental impact indicators (EN 15804+A2)											
ADP-f	MJ	2,28E+04	2,98E+03	3,67E+03	1,94E+02	1,33E+03	4,96E+01	9,77E+01	7,74E+02	1,47E+00	-5,53E+03
ADP-mm	kg Sb-eqv.	3,11E-02	4,73E-03	4,05E-03	3,11E-04	2,42E-03	5,53E-06	1,64E-04	9,41E-05	4,82E-07	-5,02E-04
AP	mol H+ eqv.	1,01E+01	9,65E-01	1,43E+00	1,18E-01	2,76E-01	3,77E-02	3,76E-02	5,73E-01	5,00E-04	-3,02E+00
EP-fw	kg P eqv.	1,88E-01	2,73E-03	1,88E-02	9,53E-05	7,01E-04	1,31E-05	6,53E-05	3,57E-04	5,90E-07	-2,78E-02
EP-m	kg N eqv.	2,10E+00	3,01E-01	3,07E-01	2,75E-02	5,59E-02	1,67E-02	1,32E-02	2,50E-01	1,72E-04	-5,58E-01
EP-T	mol N eqv.	2,25E+01	3,34E+00	3,36E+00	3,06E-01	6,25E-01	1,83E-01	1,46E-01	2,75E+00	1,90E-03	-6,52E+00
GWP-b	kg CO2 eqv.	2,38E+00	2,80E-01	-1,06E+01	4,86E-03	4,67E-02	1,00E-03	2,99E-03	5,98E-02	1,04E-04	7,83E+00
GWP-f	kg CO2 eqv.	2,00E+03	1,99E+02	2,45E+02	1,32E+01	8,82E+01	3,61E+00	6,48E+00	5,55E+01	5,27E-02	-7,72E+02
GWP-luluc	kg CO2 eqv.	1,40E+00	9,81E-02	3,32E-01	5,62E-03	3,16E-02	2,84E-04	2,37E-03	7,73E-03	1,47E-05	5,25E-01
GWP-total	kg CO2 eqv.	2,00E+03	1,99E+02	2,34E+02	1,33E+01	8,82E+01	3,61E+00	6,48E+00	5,55E+01	5,28E-02	-7,63E+02
ODP	kg CFC 11 eqv.	1,21E-04	4,20E-05	3,12E-05	2,94E-06	2,00E-05	7,79E-07	1,43E-06	1,18E-05	2,17E-08	-1,99E-05
POCP	kg NMVOC eqv.	9,53E+00	9,85E-01	1,02E+00	8,76E-02	2,31E-01	5,02E-02	4,17E-02	7,55E-01	5,51E-04	-4,37E+00
WDP	m3 world eqv.	6,46E+02	1,13E+01	8,39E+01	5,02E-01	3,75E+00	6,65E-02	3,50E-01	1,34E+00	6,60E-02	-1,42E+02
Additional environmental impact indicators (EN 15804+A2)											
ETP-fw	CTUe	7,67E+04	2,54E+03	6,55E+03	1,51E+02	1,07E+03	2,99E+01	8,71E+01	4,70E+02	9,55E-01	-2,58E+04
HTP-c	CTUh	1,51E-05	9,28E-08	1,58E-06	5,10E-09	3,01E-08	1,05E-09	2,83E-09	1,64E-08	2,21E-11	-3,50E-07
HTP-nc	CTUh	1,78E-04	2,79E-06	3,36E-05	1,53E-07	1,13E-06	2,57E-08	9,53E-08	4,04E-07	6,79E-10	1,41E-04
IR	kBq U235 eqv.	5,18E+01	1,36E+01	1,65E+01	8,45E-01	5,82E+00	2,13E-01	4,09E-01	3,45E+00	6,04E-03	1,19E+01
PM	disease incidence	1,65E-04	1,41E-05	2,03E-05	7,55E-07	5,59E-06	1,00E-06	5,83E-07	1,50E-05	9,72E-09	-4,60E-05
SQP	Pt	6,70E+03	2,04E+03	4,09E+03	1,16E+02	9,25E+02	6,33E+00	8,47E+01	1,16E+02	3,09E+00	-1,22E+03

ADP-mm= Abiotic depletion potential for non-fossil resources | **ADP-f**=Abiotic depletion for fossil resources potential | **AP**= Acidification potential, Accumulated Exceedance | **EP-fw** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | **EP-m**= Eutrophication potential, fraction of nutrients reaching marine end compartment| **EP-T**= Eutrophication potential, Accumulated Exceedance | **GWP-b**=Global Warming Potential biogenic | **GWP-f**=Global Warming Potential fossil fuels | **GWP-luluc**=Global Warming Potential land use and land use change |**GWP-total**=Global Warming Potential total| **ODP**=Depletion potential of the stratospheric ozone layer |**POCP**=Formation potential of tropospheric ozone | **WDP**=Water (user) deprivation potential, deprivation- weighted water consumption | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems | **HTP-c**=Potential Toxic Unit for Humans toxicity, cancer | **HTP-nc**= Potential Toxic Unit for humans, non-cancer | **IRP**=Potential Human exposure efficiency relative to U235, human health | **PM**=Potential incidence of disease due to Particulate Matter emissions | **SQP**=Potential soil quality index

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): one metric ton of welded steel structure elements (EN 15804+A2)											
Parameter	**Unit**	**A1**	**A2**	**A3**	**A4 SWE**	**A4 FIN**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,98E+03	7,75E+01	8,11E+02	2,52E+00	1,90E+01	2,68E-01	1,22E+00	9,86E+00	1,19E-02	1,38E+02
PERM	MJ	1,92E+00	0,00E+00	1,29E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,99E+03	7,75E+01	9,40E+02	2,52E+00	1,90E+01	2,68E-01	1,22E+00	9,86E+00	1,19E-02	1,38E+02
PENRE	MJ	2,40E+04	3,16E+03	3,89E+03	2,06E+02	1,41E+03	5,27E+01	1,04E+02	8,21E+02	1,56E+00	-5,75E+03
PENRM	MJ	9,27E+01	0,00E+00	1,16E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	2,41E+04	3,16E+03	3,90E+03	2,06E+02	1,41E+03	5,27E+01	1,04E+02	8,21E+02	1,56E+00	-5,75E+03
SM	kg	4,69E+02	0,00E+00	4,69E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,40E+02	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	8,82E-04	0,00E+00	8,90E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m3	2,30E+01	4,94E-01	3,13E+00	1,89E-02	1,42E-01	2,56E-03	1,19E-02	6,41E-02	1,57E-03	-2,72E+00
HWD	Kg	4,44E-01	8,45E-03	3,82E-02	4,49E-04	3,47E-03	1,35E-04	2,48E-04	2,04E-03	2,20E-06	-9,17E-02
NHWD	kg	7,85E+02	1,25E+02	9,46E+01	7,84E+00	6,43E+01	5,88E-02	6,20E+00	9,90E-01	1,00E+01	-7,28E+01
RWD	kg	5,22E-02	1,99E-02	1,63E-02	1,33E-03	9,07E-03	3,45E-04	6,42E-04	5,37E-03	9,67E-06	3,67E-03
CRU	kg	1,03E-02	0,00E+00	1,04E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,00E+01	0,00E+00	0,00E+00
MFR	kg	5,33E+00	0,00E+00	9,83E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	2,64E-03	0,00E+00	2,56E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EET	MJ	0,00E+00	0,00E+00	1,51E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	8,74E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw materials | **PERM**= Use of renewable primary energy resources used as raw materials | **PERT**=Total use of renewable primary energy resources | **PENRE**= Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | **PENRM**= Use of non-renewable primary energy resources used as raw materials | **PENRT**= Total use of non-renewable primary energy resources | **SM**=Use of secondary material | **RSF**=Use of renewable secondary fuels | **NRSF**=Use of non-renewable secondary fuels | **FW**=Use of fresh water | **HWD**=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed | **CRU**=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported energy, thermical | **EE**=Exported energy, electrical

LCA results - information on biogenic carbon content at the factory gate: LCA results - one metric ton of welded steel structure elements (EN 15804+A2)		
Parameter	**Unit**	**Value**
biogenic carbon content in product	kg C	0,00
biogenic carbon content in accompanying packaging	kg C	4,19
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO2		

6. LCA: Interpretation

6.1 Dominance analysis

The following figures show the influence of different life stages for the welded and painted steel structures. The results are shown separately for A4 transportation scenarios to construction site, in Stockholm (Sweden) and Helsinki (Finland), respectively.

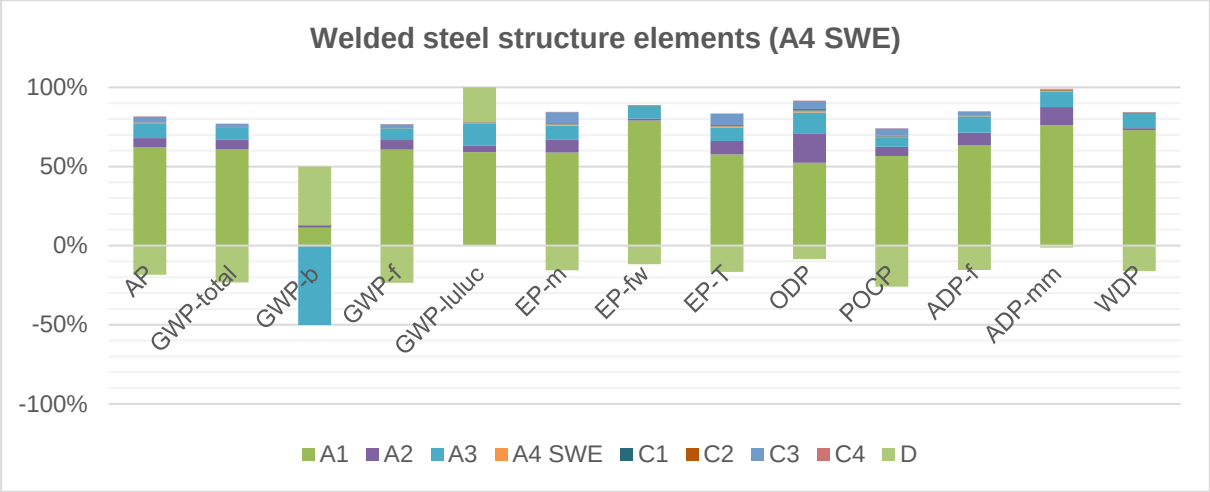


Figure 2: Influence of the modules on the environmental core indicators (A4 Sweden)

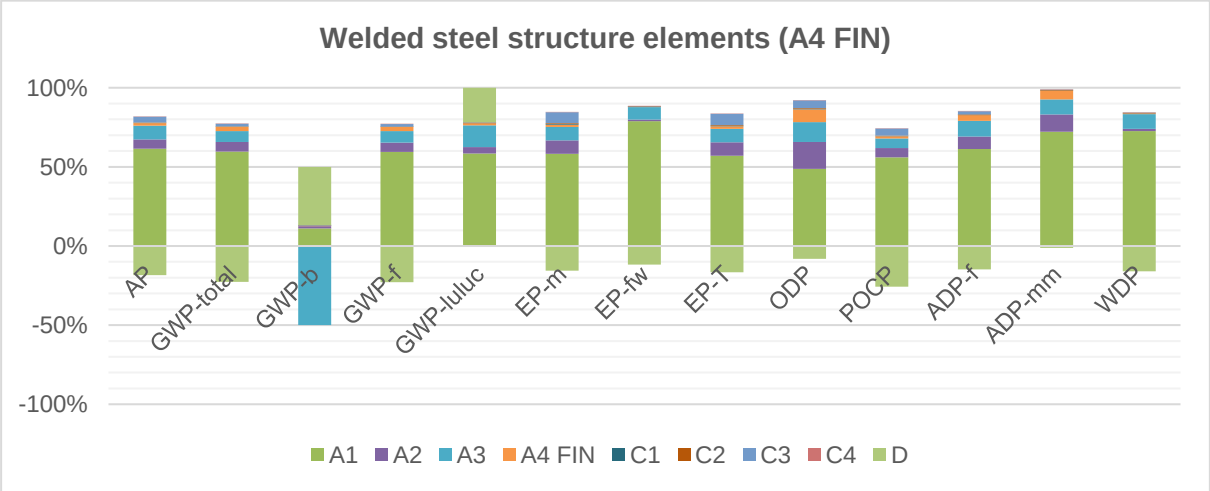


Figure 3: Influence of the modules on the environmental core indicators (A4 Finland)

As shown in the Figure 2 and 3, most of the environmental impact of declared 1 ton of welded steel structure elements (painted) is attributed to the raw material processing phase (A1), followed by raw material transportation (A2) and the production phase (A3). Potential credits come mainly from the material recovery of steel.

6.2 Data quality

Overall, the quality of the data can be considered as good overall. The primary data collection has been done thoroughly. Data quality was calculated using the Data Quality level and criteria according to the PEF approach (Annex E.2 of EN15804+A2). The DQRs range from 1,67 to 2,67 for the most abundant inputs in terms of mass.

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ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines

EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

EN 16449:2014, Wood and wood-based products – Calculation of the biogenic carbon content of wood and conversion to carbon dioxide

ISO 21930:2007, Sustainability in building construction – Environmental declaration of building products

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